KN13 - *In silico* metabolic engineering: from research to the market

Isabel Rocha[1,2]

[1]Center of Biological Engineering, University of Minho, Campus de Gualtar, 4710-057 Braga, Portugal; [2]SilicoLife, Ltd, Rua do Canastreiro, nº 15, 4715-387 Braga, Portugal. (irocha@deb.uminho.pt)

The emergence of industrial biotechnology projects in the last years has created the need to accelerate the tasks of strain development, as most strains have naturally evolved for growth and not for the production of desired compounds. Moreover, in many cases, microbial strains are being used to produce compounds that are not native to their metabolism, requiring the addition of heterologous genes.

Thus, concurrently with fast and novel developments in molecular biology, there has been a significant investment in modelling and computational tools to aid rational strain design efforts. In our research group at Minho University, Portugal, we have been involved in several projects where relevant tools such as OptGene [1] have been developed and were responsible for launching a user-friendly, widely used software tool in metabolic engineering projects: the OptFlux [2] platform. More recently, we have also launched the merlin tool [3] for aiding in genome-scale model reconstruction processes.

Based on the knowledge accumulated in the *in silico* metabolic engineering field, the spinoff company SilicoLife was launched in 2010 to answer some market needs that could not have been addressed through the University. SilicoLife is now a fully independent company specialized in designing *in silico* metabolic engineering solutions for industrial biotechnology, having projects with some of the major players in the field worldwide, both from industry and academia. SilicoLife has several proprietary technologies, from a pipeline for microbial model reconstruction to tools that aid the identification of non-trivial interventions such as gene knockouts and over/underexpressions for re-directing the metabolic fluxes to the desired target. More recently, SilicoLife has developed a novel framework, called NeoSynth, to aid in synthetic biology projects allowing to enumerate potentially novel enzymatic steps, making use of enzyme promiscuity or through enzyme engineering.

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